

THE RELATIVE IMPORTANCE OF VISION AND THE CHEMICAL SENSE IN ANAX LARVÆ.

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General observations and experimental work on the larvæ of *Anax junius* for over a year, seemed to indicate that the responses of these insects are chiefly dependent on the sense of sight. Thus taking of food, in particular, seems to be the result of reactions to form and movement. General observation also indicated that the chemical sense was correspondingly weak. Although the question of image-formation in insects has been treated by Cole (1907), Demoll (1910), Forel (1908), and Seitz (1912); and the chemical sense by numerous authorities, including Forel (1908), Kafka (1918), and Lubbock (1888); apparently no work has been done with dragon-fly larvæ. Accordingly, two experiments were made; one to test the reactions of the larvæ to form, the other to determine whether or not they would react to the chemical emanations from distant objects. Each experiment is a check on the other, and both are related to prehension.

Reaction to Form.

Individual.	Positive responses	Negative responses
1. Food:	15	0
Triangle:	4	7
2. Food:	9	7
Triangle:	1	12
3. Food:	11	2
Triangle:	0	9
4. Food:	10	0
Triangle:	4	15
5. Food:	9	5
Triangle:	1	11
6. Food:	8	5
Triangle:	0	13
7. Food:	13	2
Triangle:	0	16
8. Food:	10	0
Triangle:	1	15
9. Food:	9	7
Triangle:	0	12
10. Food:	11	4
Triangle:	0	8

Chemical Sense.

In ten of the twelve tests a broth made from meal-worms was used. In the remaining trials pyridine was substituted for the broth.

Individual	Positive response	Negative response	No response
1.	5	0	6
2.	0	4	8
3.	1	1	10
4.	1	3	8
5.	4	4	4
6.	0	0	12
7.	0	0	12
8.	0	0	12
9.	3	1	8

Discussion.

The larvæ were numbered and a record kept of their behavior. Almost daily, but not always at the same hour, each insect was fed a bit of meal-worm (*Tenebrio molitor*) about three cubic mms. in volume. Every day the insects were stirred with a paper triangle on the end of a needle. The triangle had an area of about one square cm. It was at first presumed, because of the results of experiments indicating that these animals have some degree of memory, that learning would simplify the experiment; but in this case the larvæ gave no evidence of associating either a pleasant sensation with the food or an unpleasant one with the triangles. Probably any tendency to form associations was inhibited by the complexities of the experiment.

The above experiment is open to the objection that some chemical sense may have influenced the behavior of the larvæ. Nine insects were tested by introducing into the water near them a broth made from meal-worms. This was introduced at all possible distances from, and all possible angles to, the insects. Some larvæ moved their mandibles when surrounded by a dense cloud of the suspension; most of them seemed totally unaware of the presence of the liquid. This broth was a visible suspension, which probably accounts for the fact that larvæ 1 and 9 extended their labia when it was introduced. They gave no response when their eyes were covered with asphaltum.